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(54) INK JET RECORDING BODY

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a pigment-based high-performance ink jet recording body, which has a crack-free porous ink accepting layer, is excellent in gloss, transparency and water resistance and favorable in image quality and ink drying properties.

SOLUTION: In the ink jet recording body having one or more coating layers on a base material, in at least one layer, the porous ink accepting layer is formed by coating a water-based paint prepared by mixing 1 to 100 pts.wt. of a hydrophilic resin (b), which has no radical polymerizable unsaturated bonding and forms a hydrogel through an electron beam irradiation of an aqueous solution, with 100 pts.wt. of fine pigment (a), the mean particle diameter of which is 1 μ m or less and the pore volume of 0.4 to 2.5 ml/g, and then hydrogelating the coating layer through the electron beam irradiation and finally drying so as to form the porous ink accepting layer of the ink jet recording body.

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CLAIMS

[Claim(s)]

[Claim 1] In the ink jet record object which has the above coating layer further on a base material Pore capacity by 1 micrometer or less further at least The detailed pigment of 0.4 – 2.5 ml/g, [(a) mean particle diameter] (b) The 100 weight sections (aforementioned [a]) are received in the hydrophilic resin which forms hydro gel by not having the unsaturated bond of radical polymerization nature, and irradiating an electron ray at a water solution. The ink jet record object which is the ink absorbing layer of the porosity dried and formed after having applied the water paint contained at a rate of the above (b) 1 – the 100 weight sections, irradiating the electron ray subsequently and carrying out hydro gelation of this spreading layer.

[Claim 2] In the ink jet record object which has the above coating layer further on a base material The (c) mean diameter does not have the unsaturated bond of a detailed pigment 1 micrometer or less and (d) radical polymerization nature further at least. And the 100 weight sections (aforementioned [c]) are received in the hydrophilic resin which forms hydro gel by irradiating an electron ray at a water solution. The ink jet record object which was dried and formed after having applied the water paint contained at a rate of the above (d) 1 – the 100 weight sections, irradiating the electron ray subsequently and carrying out hydro gelation of this spreading layer and whose pore capacity is the ink absorbing layer of 0.2–2.0ml [/g] porosity.

[Claim 3] The ink jet record object according to claim 1 or 2 whose dry weight percentage reduction of this ink absorbing layer after 1-hour immersion is 10% or less at water.

[Claim 4] The hydrophilic resin which forms hydro gel by not having the unsaturated bond of radical polymerization nature, and irradiating an electron ray at a water solution Polyvinyl alcohol, polyethylene oxide, polyalkylene oxide, A polyvinyl pyrrolidone, a water-soluble polyvinyl acetal, a Polly N-vinyl acetamide, Polyacrylamide, poly acryloyl morpholine, polyhydroxy alkyl acrylate, Polyacrylic acid, hydroxyethyl cellulose, methyl cellulose, The hydroxypropyl methylcellulose, hydroxypropylcellulose, gelatin, casein and these water-soluble derivatives, the ink jet record object according to claim 1 to 3 that is at least one sort chosen from the group which becomes a list from these copolymers.

[Claim 5] The ink jet record object according to claim 4 whose hydrophilic resin which forms hydro gel by not having the unsaturated bond of radical polymerization nature, and irradiating an electron ray at a water solution is a cationic derivative.

[Claim 6] The ink jet record object according to claim 1 to 5 with which a detailed pigment is chosen from the group which it becomes from a silica, an aluminum hydroxide, boehmite, pseudo-boehmite, and an alumina and which is a kind at least.

[Claim 7] The ink jet record object according to claim 1 to 6 whose detailed pigment is an aggregated particle with a mean particle diameter of 8–800nm which a primary particle with a mean particle diameter of 3–40nm comes to condense.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] About the ink jet record object which has the ink absorbing layer which consists mainly of a pigment, it excels in gloss, transparency, and a water resisting property, and this invention relates to image quality or a high performance ink jet record object also with good ink drying.

[0002]

[Description of the Prior Art] Conventionally, various methods, such as a wire dot recording method, a sensible-heat coloring recording method, a heat-of-fusion imprint recording method, a sublimation recording method, an electrophotography method, and an ink jet recording method, are developed as objects for an output, such as a computer. Since an ink jet recording method has that a regular paper can be used as a sheet for record, that a running cost is cheap, and compact hardware and it is cheap in this, it is recognized as a recording method suitable for personal YUZU. By furthermore having attained full-color-izing and high resolution-ization in recent years, it is observed also as an easy output means of a color picture, and the selling number of a printer is lengthened quickly.

[0003] The ink containing water, a color, an organic solvent, an additive, etc. is quickly absorbed on the ink jet record object used for the output of these ink jet printers, the depth of shade of that a minute alphabetic character or a minute image is reproducible and an image is high, and it is needed for it as fundamental engine performance for there to be no bias in a color tone etc. Since this demand is filled, a high performance ink jet record object has many by which the ink absorbing layer of dedication is prepared on the base material, and these acceptance layer can be divided roughly into two kinds, a resin system and a pigment system. A resin system acceptance layer applies the water solution of water soluble resin, such as polyvinyl alcohol, a polyvinyl pyrrolidone, a water-soluble cellulosic, and gelatin, at a base material sheet, dries it to a base material, is formed in it, and can usually do manufacture comparatively cheaply and easily. Moreover, many resin system acceptance layers are used taking advantage of the high transparency also as an ink jet record object for over head projectors (it omits Following OHP) for which translucency is needed. In addition, there is the advantage in which the ink absorbed amount per unit weight of an acceptance layer is large compared with a pigment system.

[0004] However, various engine performance, such as not producing blocking, even if saved in the state of that an image does not deteriorate even if it notifies outside indoor drying [of not only the demand to the image quality side already mentioned as an ink jet record object but ink], the water resisting property of a printing object, and for a long period of time, and a laminating, is needed. The resin system acceptance layer is especially inferior in ink drying and a water resisting property compared with the pigment system acceptance layer, and those improvements were needed. Using a cross linking agent as a general upgrading measure, a bridge is constructed in the water soluble resin of an acceptance layer, or the attempt which gives a water resisting property by mixing hydrophobic resin has been performed. however, no matter what resin [cross linking agent or hydrophobic resin] it might use, when sufficient water resisting property was given, ink absorptance of an acceptance layer could not be markedly alike, was not able to

decline, and could be incompatible in image quality and a water resisting property.

[0005] Then, this invention persons applied to the base material sheet the aquosity constituent which contains the water soluble resin which forms hydro gel by not having the unsaturated bond of radical polymerization nature, and irradiating an electron ray at a water solution as a principal component, and proposed the resin system acceptance layer which it makes it come to dry after irradiating an electron ray subsequently and making hydro gel form (JP,11-157202,A publication). The water resisting property was given without this resin system acceptance layer degrading image quality greatly compared with the acceptance layer for which a bridge is not constructed [which did not irradiate an electron ray]. However, this resin system acceptance layer needed the further amelioration, in order for a limitation to be in ink rate of absorption and to have satisfied image quality and the ink drying time to the latest ink jet printer with much ink discharge quantity, since it was not porosity but the device which absorbs ink by swelling. Moreover, it was what is inferior to the water resisting property of the pigment system acceptance layer of high performance also about a water resisting property although it was level very high as a resin system acceptance layer. Although the example of the ink jet record sheet which has the outer layer containing a polyalkylene oxide system water soluble polymer and colloidal silica which carried out electron ray hardening was indicated by JP,8-207423,A and JP,8-267905,A, since this acceptance layer was not porosity only by the pigment distributing in resin, ink absorption was what advances only by the swelling of an acceptance layer like the acceptance layer which consists of only resin.

[0006] On the other hand, in order that the pigment system acceptance layer which hardens a pigment by binder resin and is manufactured may receive ink quickly by capillarity to the pore secured within and without the pigment and may form an image, compared with the resin system acceptance layer which absorbs ink, the image quality of high level and ink drying tend to be acquired by the dissolution and swelling. Moreover, if a pigment system acceptance layer has a water resisting property in binder resin, it will become very high [the water resisting property of an acceptance layer]. However, in order to have to secure the pore capacity which can respond to the ink breathed out enough in order to obtain a quality image into an acceptance layer and to correspond to a high quality ink jet printer with much ink discharge quantity, very many amounts of coating are needed.

[0007] As current and a pigment system acceptance layer currently manufactured, the synthetic amorphous silica of the shape of powder with a mean particle diameter of 1-20 micrometers is distributed underwater, and there are some which applied the coating which mixed waterproof binder resin and an additive there. Although such a pigment system acceptance layer has a water resisting property and there are also many ink absorbed amounts, since the mean particle diameter of a pigment is large, the transparency of an ink absorbing layer is low. Even when it is not only unsuitable, but the transparency of an ink absorbing layer was low and an opaque base material is used for manufacturing a translucency record object using a transparence base material, since the printing concentration of an image becomes low, it becomes disadvantageous. Moreover, since the synthetic amorphous silica used here has large particle diameter and it is uneven, the glossiness of an acceptance layer also becomes low and it is not suitable for manufacture of a gloss ink jet record object.

[0008] In order to think the glossiness of an ink absorbing layer, and ink absorptive power as important and to produce a high quality ink jet record object based on the above point, pore capacity is large and a detailed pigment with it is used suitably. [small and mean particle diameter and] [uniform] Especially, detailed pigments, such as a silica, an aluminum hydroxide, boehmite, pseudo-boehmite, and an alumina, are used suitably. However, since these detailed pigments have a large pore capacity, and the pole diameter is small and contraction by the capillary force generated during the desiccation after coating occurs notably, a coating layer tends [very] to crocodile. the high-polymer full saponification polyvinyl alcohol which the binder force is strong, crystallizes after desiccation, and serves as a water resisting property in producing an acceptance layer using these detailed pigments according to this invention person's etc. examination -- mixing -- every [the amount of low coating] -- multilayer coating carries out in a number step, and the fall of the gloss and the transparency resulting from the crack of

an acceptance layer and a crack can control by reducing the shrinkage force which generates at the time of one desiccation. However, not only such multilayer coating has low manufacture effectiveness, but the coating after a bilayer eye requires [not spoiling the opening formed into the lower layer, and] cautions, and the problem on operation, such as generating of air bubbles, tends to generate it. Therefore, if possible, it is desirable for the amount of need coating to be securable by 1 time of coating. However, if the quantity of binder resin is only increased in order to prevent a crack, since resin will bury the pore which a detailed pigment forms, it will have a bad influence on ink absorptivity.

[0009] So, in JP,7-76161,A, added polyvinyl alcohol, the boric acid, or the borate to detailed pigment dispersion liquid, the paint film under desiccation was made to gel, and it has proposed controlling generating of a minute crack leading to a crack. Although the binder force increased and it was thought that it was effective for crack prevention when making the paint film before desiccation gel, this approach had a problem in the stability of coating liquid. In addition, there is the sol coating approach of removing a deflocculant, by exposing after coating the detailed pigment dispersion liquid currently stabilized by the deflocculant of an acid or alkali given in JP,6-218324,A as the technique of making the paint film before desiccation gel to alkali or an acid gas. Although this technique can also expect a certain amount of crack depressor effect, since an odor may remain in that it is necessary to deal with a high-concentration gas at the time of acceptance layer manufacture, and the paint film after desiccation or Last pH may incline toward acidity or alkalinity remarkably, there is a problem in implementability. In JP,9-263038,A, as an approach of making a paint film gelling before desiccation, after passing through the process which ionizing radiation is irradiated [process] in the coating liquid which mainly consists of an inorganic sol and an ionizing-radiation hardenability compound after coating, and stiffens this ionizing-radiation hardenability compound, the approach of drying a paint film and forming an ink acceptance layer is proposed. However, even if these researchers try this approach, when gel with sufficient reinforcement cannot be obtained but a detailed pigment with a high, big pore capacity of ink absorptivity ability is used, the acceptance layer has crocodiled at the time of desiccation. Moreover, since there is much what has the comparatively strong thing and the skin irritation of low molecular weight, an ionizing-radiation hardenability compound has many points about which we are anxious in respect of the bad influence to the quality of printed character by the non-hardened component, or safety. Furthermore, since almost all the ionizing-radiation hardenability compound marketed has the low hydrophilic property, it will not be suitable for drainage system coating general to the coating of an ink jet acceptance layer, and the width of face of selection of an ingredient will become extremely narrow. Even if it tries gelation by the chemical cross linking agent which is the general technique, in order for chemistry bridge formation to, take a certain amount of heat and time amount on the other hand, a gelation rate does not catch up with the rate of drying of a coating layer, but before gelation advances, a crack will occur.

[0010]

[Problem(s) to be Solved by the Invention] The purpose of this invention has the ink absorbing layer of porosity without a crack, and it excels in gloss, transparency, and a water resisting property, and it offers image quality and a pigment system high performance ink jet record object also with good ink drying. Moreover, using the detailed pigment which is especially easy to crack, even when there are many amounts of coating of an ink absorbing layer, the pigment system high performance ink jet record object which a crack does not produce is offered.

[0011]

[Means for Solving the Problem] This invention adopts the following configuration in order to solve the above-mentioned technical problem. "Namely, invention of the 1st of this invention In the ink jet record object which has the above coating layer further on a base material Pore capacity by 1 micrometer or less further at least The detailed pigment of 0.4 - 2.5 ml/g, [(a) mean particle diameter] (b) The 100 weight sections (aforementioned [a]) are received in the hydrophilic resin which forms hydro gel by not having the unsaturated bond of radical polymerization nature, and irradiating an electron ray at a water solution. After applying the water paint contained at a rate of the above (b) 1 - the 100 weight sections, irradiating an

electron ray subsequently and carrying out hydro gelation of this spreading layer, it is the ink jet record object which is the ink absorbing layer of the porosity dried and formed."

[0012] "Invention of the 2nd of this invention, in the ink jet record object which has the above coating layer further on a base material The (c) mean diameter does not have the unsaturated bond of a detailed pigment 1 micrometer or less and (d) radical polymerization nature further at least. And the 100 weight sections (aforementioned [c]) are received in the hydrophilic resin which forms hydro gel by irradiating an electron ray at a water solution. After applying the water paint contained at a rate of the above (d) 1 – the 100 weight sections, irradiating an electron ray subsequently and carrying out hydro gelation of this spreading layer, it is the ink jet record object which was dried and formed and whose pore capacity is the ink absorbing layer of 0.2–2.0ml [/g] porosity."

[0013] Invention of the 3rd of this invention is "an ink jet record object given in the above 1st whose dry weight percentage reduction of this ink absorbing layer after 1-hour immersion is 10% or less at water, or invention of 2."

[0014] Invention of the 4th of this invention, "the hydrophilic resin which forms hydro gel by not having the unsaturated bond of radical polymerization nature, and irradiating an electron ray at a water solution Polyvinyl alcohol, polyethylene oxide, polyalkylene oxide, A polyvinyl pyrrolidone, a water-soluble polyvinyl acetal, a Poly N-vinyl acetamide, Polyacrylamide, poly acryloyl morpholine, polyhydroxy alkyl acrylate, Polyacrylic acid, hydroxyethyl cellulose, methyl cellulose, The hydroxypropyl methylcellulose, hydroxypropylcellulose, They are gelatin, casein and these water-soluble derivatives, and an ink jet record object given in invention of the 1–3rd either of the above which is at least one sort chosen from the group which becomes a list from these copolymers."

[0015] Invention of the 5th of this invention is "an ink jet record object given in the 4th above-mentioned invention whose hydrophilic resin which forms hydro gel by not having the unsaturated bond of radical polymerization nature, and irradiating an electron ray at a water solution is a cationic derivative."

[0016] Invention of the 6th of this invention is "an ink jet record object given in one invention of the above 1–5 which is chosen from the group which a detailed pigment becomes from a silica, an aluminum hydroxide, boehmite, pseudo-boehmite, and an alumina and which is kinds at least."

[0017] Invention of the 7th of this invention is "an ink jet record object given in invention of the 1–6th either of the above which is aggregated particles with a mean particle diameter of 8–800nm to which a detailed pigment comes to condense a primary particle with a mean particle diameter of 3–40nm."

[0018] Although this invention persons could change with the raw material of an ink absorbing layer excellent in image quality or ink drying, they examined [various] how an ink absorbing layer would be constituted using the detailed pigment which the crack at the time of desiccation tends to generate. Consequently, in order to obtain the high gloss and the ink absorbing layer of high transparency which are the amount of high coating which can respond to the latest ink jet printer with much ink discharge quantity, and do not have a crack, it had a new appreciation of the reinforcement of the binder resin used for a coating layer being raised considerably.

However, sufficient reinforcement for binder resin was not able to be given in a Prior art.

[0019] Then, when the water paint which mixed full saponification polyvinyl alcohol with the detailed pigment generally used first as binder resin was applied to the base material so that it might be set to the amount of coating of 25g/m² with dry weight, and the electron ray was irradiated immediately, it turned out that a bridge is constructed over binder resin and the whole coating layer serves as hydro gel of high gel strength. Furthermore, when the paint film was dried, high gloss without a crack and the ink absorbing layer of high transparency were obtained by work of the binder resin which serves as gel of the amount of giant molecules according to bridge formation. When printed with the ink jet printer to this paint film, the high definition image was obtained and ink drying was good. Since the intense crack occurred on the whole surface on the other hand even if it was going to produce the ink absorbing layer, without performing electron beam irradiation as a comparison, it became unsuitable as an ink jet record object. Moreover, when the effect of electron beam irradiation was investigated and seen on the amount

conditions of low coating which can form membranes, without crocodiling even if it does not carry out electron beam irradiation, it turned out that condensation of the detailed pigment with which the coating layer which gave electron beam irradiation happens at the time of desiccation is controlled, and glossiness and transparency become high compared with the coating layer which did not perform electron beam irradiation. Furthermore, since it gelled before binder resin's drying, and reinforcement increased, the powder omission of the detailed pigment from the migration and the acceptance layer front face of binder resin under desiccation was prevented, and, also in the advantage of the water resisting property of a paint film improving, a certain thing became clear. In addition, bridge formation of the binder resin by this electron beam irradiation with the same crack prevention, even when various hydrophilic resin other than the full saponification polyvinyl alcohol which boils comparatively and a crack cannot produce easily is used as binder resin, since it is not what limits to the resin which has a specific functional group, and occurs It is checked that gloss, transparency, and the waterproof improvement effectiveness are acquired, and image quality and a high performance ink jet record object also with good ink drying can be manufactured, and it came to complete this invention.

[0020]

[Embodiment of the Invention] Mean particle diameter uses a detailed pigment 1 micrometer or less for this invention. The acceptance layer which is excellent in ink absorptivity by this, and is excellent also in transparency and glossiness is obtained. Mean particle diameter is the particle size (KYUMURANTO value calculated by law) measured by dynamic light scattering here. Although a class is not limited, various well-known pigments are mentioned in the field of common coated paper, such as a commercial pigment, for example, a silica, aluminosilicate, a kaolin, clay, baking clay, a zinc oxide, tin oxide, an aluminum hydroxide, boehmite, pseudo-boehmite, an alumina, a calcium carbonate, a satin white, aluminum silicate, a smectite, a magnesium silicate, a magnesium carbonate, magnesium oxide, diatomaceous earth, a styrene system plastics pigment, a urea-resin system plastics pigment, and a benzoguanamine system plastics pigment, or an ink jet record form. Also in these detailed pigments, especially a silica, an aluminum hydroxide, boehmite, pseudo-boehmite, and an alumina have a large pore capacity, and since it excels in ink absorptivity, they are used suitably.

[0021] Since pore capacity is the largest, especially a silica is desirable. All are desirable although there are a wet method silica which uses silicic-acid alkali salt as a raw material, and a dry-process silica which disassembles volatile silicon compounds, such as a silicon tetrachloride, in a flame as silica. The pore capacity of a suitable silica is 0.4 - 2.1 ml/g. Moreover, although there is also a silica generally called colloidal silica, this usually processes a silicic-acid alkali salt water solution with ion exchange resin, a silicic-acid water solution is manufactured, and after adding alkali and stabilizing a silicic-acid water solution, the liquid in which was heated and the detailed silica carried out mono dispersion is made, a silicic-acid water solution is added gradually, this silica particle is grown up, and it is manufactured. The silica particle does not form the aggregated particle so that the manufacture approach may show colloidal silica. Therefore, pore capacity is the range of 0.2-0.3ml/g, and since there are few ink absorbed amounts even if it uses for an ink absorbing layer, it is disadvantageous.

[0022] Although a detailed pigment with a mean particle diameter of 1 micrometer or less is used in order to obtain high gloss and the ink absorbing layer of high transparency, the detailed pigment is an aggregated particle with a mean particle diameter of 8-800nm which a primary particle with a mean particle diameter of 3-40nm comes to condense preferably. 9-700nm especially of particle size of an aggregated particle is 10-500nm more preferably. Since such an aggregated particle has an opening in the interior of an aggregated particle, its pore capacity is large. Since the opening between aggregated particles can furthermore also be used for ink absorption, ink absorptance is high. Moreover, since a primary particle is small enough compared with the wavelength of light, as compared with the pigment which does not form the aggregated particle, its scattering power force of light is small, and it has the advantage to which the transparency of an ink absorbing layer becomes high. Since it will be hard coming to form the opening which contributes to ink absorption if the diameter of a primary particle and the diameter of an aggregated particle of a pigment are too small, there is a possibility that the ink

absorptivity of an acceptance layer may be inferior. On the contrary, if the diameter of a primary particle and the diameter of an aggregated particle are too large, the transparency of a recording layer will fall, and there is a possibility of being hard to obtain high printing concentration.

Moreover, when the diameter of an aggregated particle is too large, not only the gloss of an acceptance layer falls, but there is a possibility of becoming a surface rough deposit and the cause of powder omission. In addition, all the diameters of a primary particle of the pigment as used in the field of this invention are the particle size (diameter of Martin) observed with the electron microscope (SEM and TEM) (a "particle handbook", Asakura Publishing, p52 reference). Moreover, the diameter of an aggregated particle is the particle size measured by dynamic light scattering.

[0023] Moreover, although the higher one of the pore capacity of a detailed pigment is desirable in order to obtain the high ink absorbing layer of ink absorbing power, the pore capacity of the detailed pigment used suitable for this invention is 0.4 – 2.5 ml/g. It is 0.4 – 2.0 ml/g preferably, and is 0.7 – 1.8 ml/g most preferably 0.6 to 1.9 ml/g. This pore capacity is the value calculated using the specific surface area and the pore distribution measuring device by the gas absorption method. In addition, in this invention, pore capacity is a total pore capacity of pore with a pore diameter of 100nm or less. In a detailed pigment system acceptance layer, since the ink absorptivity of a coating layer becomes high and contraction by the capillary force generated at the time of the desiccation after coating also becomes large so that the pore capacity of a detailed pigment is generally high, by the general coating approach, it is easy to cause the poor membrane formation by the crack, and hard to present practical use. However, the ink jet record object of this invention does not need concern of such poor membrane formation.

[0024] The approach of grinding and acquiring dispersedly by giving the strong force by the mechanical means to the pigment (several micrometers) of marketing as one of the means of the, although especially the manufacture approach of these detailed pigments is not limited is mentioned. That is, breaking It is obtained by the down method (how to subdivide a massive raw material). As a mechanical means, the mechanical technique of an ultrasonic homogenizer, a pressure type homogenizer, a nano mizer, a high-speed tumbling mill, a roller mill, a container drive medium mill, a medium agitation mill, a jet mill, a Sand grinder, etc. is mentioned. The detailed pigment obtained may be colloid or may be a slurry-like. As the manufacture approach of other desirable detailed pigments, the approach by hydrolysis of the metal alkoxide currently indicated by JP,5-32413,A, JP,7-76161,A, etc. is mentioned.

[0025] It does not have the unsaturated bond of the radical polymerization nature which is another principal component of the water paint used by this invention. and as hydrophilic resin which forms hydro gel by irradiating an electron ray at a water solution Full saponification polyvinyl alcohol, partial saponification polyvinyl alcohol, Polyethylene oxide, polyalkylene oxide, a polyvinyl pyrrolidone, A water-soluble polyvinyl acetal, a Polly N-vinyl acetamide, polyacrylamide, Poly acryloyl morpholine, polyhydroxy alkyl acrylate, Polyacrylic acid, hydroxyethyl cellulose, methyl cellulose, the hydroxypropyl methylcellulose, hydroxypropylcellulose, gelatin, casein, and these water-soluble derivatives can be illustrated. The derivative which esterified, etherified and amidated functional groups, such as a cation denaturation article, an anion denaturation article, and a hydroxyl group, a carboxyl group, an amino group, in the water-soluble derivative, for example, and carried out chemical modification to it, and the polymer which introduced other side chains by graft polymerization can be illustrated. Moreover, the copolymer containing said each resin or a water-soluble derivative is sufficient. As a copolymer, the copolymer which consists of vinyl monomers, such as polyvinyl alcohol, a polyvinyl pyrrolidone, a water-soluble polyvinyl acetal, a Polly N-vinyl acetamide, polyacrylamide, poly acryloyl morpholine, polyhydroxy ethyl acrylate, and polyacrylic acid, and the copolymer containing monomers other than the monomer which constitutes these polymers can be illustrated. Moreover, it not only uses these resin independently, but two or more kinds can be mixed and it can use it. In these hydrophilic resin, since the miscibility of polyvinyl alcohol with a detailed pigment is good, it is desirable.

[0026] Incidentally, hydro gel is a macromolecule with the three-dimensional network in the condition of having swollen water with the solvent used as a principal component, and is in a condition without a fluidity. Since the electron ray crosslinking reaction in this invention starts

mainly by hydrogen drawing, a specific functional group does not construct a bridge. Since descriptions differ for every class of resin, it cannot generally say, but when the optimum value of the molecular weight of said hydrophilic resin of this invention specification is too high not much, when it mixes with a detailed pigment, even if coating liquid tends to gel it and it does not result in gelation, a possibility that a problem may occur is in coating nature -- coating liquid serves as hyperviscosity. On the contrary, even if molecular weight is too low, since the gel strength of the hydro gel obtained by electron beam irradiation becomes inadequate, the crack of the paint film after desiccation occurs, and there is a possibility that the effectiveness of this invention may not fully be acquired. Therefore, 10,000 to about 5 million are good by resin typical as a standard of molecular weight, and the thing of 50,000-1 million is good more preferably.

[0027] Especially as said specific derivative and specific copolymer of hydrophilic resin, a cation denaturation object is suitable. For example, cationic polyvinyl alcohol, a cationic polyvinyl pyrrolidone, a cationic water solubility polyvinyl acetal, a cationic Poly N-vinyl acetamide, cationic polyacrylamide, cationic poly acryloyl morpholine, cationic polyhydroxy alkyl acrylate, cationic hydroxyethyl cellulose, cationic methyl cellulose, the cationic hydroxypropyl methylcellulose, cationic hydroxypropylcellulose, cationic gelatin, cationic casein, etc. are mentioned. Since the color which is a coloring component in the ink used for an ink jet printer, and a pigment have many which have an anionic radical, all over an ink absorbing layer, a cationic ink fixing agent is used suitably. Since the effectiveness of preventing the color tone change with time accompanying migration of the coloring matter which it not only strengthens the water resisting property of the image after printing more, but happens in an acceptance layer after printing, and a blot of an image is expected, it is suitable that the pigment of a principal component uses cationic resin for binder resin in the case of anionic pigments, such as a silica. Moreover, it is also effective for color tone change with time after printing to use resin with high compatibility with the hydrophilic high boiler contained in ink, being independent or mixing. As a hydrophilic high boiler contained in ink A glycerol, ethylene glycol, a diethylene glycol, triethylene glycol, A polyethylene glycol, propylene glycol, dipropylene glycol, The diethylene-glycol monomethyl ether, 2-pyrrolidone, thiodiglycol, There are the triethylene glycol monobutyl ether, 1,5-pentanediol, etc. as resin with high compatibility with these solvents Although a polyvinyl pyrrolidone, poly acryloyl morpholine, polyhydroxy alkyl acrylate, hydroxypropylcellulose, etc. are mentioned, it is not limited to especially these.

[0028] The rate of the mixture of the hydrophilic resin which forms hydro gel is the 1 - 100 weight section about said hydrophilic resin to said detailed pigment 100 weight section by the mean diameter which is the principal component of an ink absorbing layer not having a detailed pigment 1 micrometer or less and the unsaturated bond of radical polymerization nature, and irradiating an electron ray at a water solution. Since the ink jet record object of this invention is what forms an image by receiving ink to the pore mainly formed within and without the detailed pigment, as for said amount of hydrophilic resin, from a viewpoint of ink absorption, it is desirable to hold down to the minimal dose. Moreover, since hydrophilic resin is what increases the appearance particle size of the detailed pigment in an acceptance layer, little way of hydrophilic resin is good also from the viewpoint of the transparency of an acceptance layer within limits which a crack does not generate. from the above reason -- further -- desirable -- said detailed pigment 100 weight section -- receiving -- said hydrophilic resin -- 3 - 30 weight section -- 5-25 weight section content is carried out most preferably.

[0029] As for an ink absorbing layer, it is desirable to adjust so that pore capacity may become the range of 0.2 - 2.0 ml/g. By selection of the pore volume of a detailed pigment, it can adjust within the limits of this by adjusting the addition of hydrophilic resin appropriately again. When pore capacity is less than 0.2 ml/g, since ink is unabsorbable unless it makes [many] the amount of coating, the manufacturing cost of an ink jet record object becomes high. Moreover, it becomes [the mechanical strength of an ink absorbing layer falls by the pore capacity which exceeds g in 2.0ml /, and / a blemish is sufficient for an acceptance layer just, and separate, or] easy to be divided and is not desirable. In addition, the pore capacity of this invention is a total pore capacity of pore with a pole diameter of 100nm or less.

[0030] Although the suitable solid content concentration of the water paint used for this

invention changes greatly with classes of the detailed pigment of a principal component, and resin, it is desirable that a water paint is high concentration more within limits with stability and coating possible in which. It is because the effectiveness of the crosslinking reaction which advances by electron beam irradiation not only increases, but it can expect high gel strength also from the coating layer after gelation and a desiccation load becomes light, so that a water paint is high concentration. In the hydrophilic resin which forms hydro gel by not having the unsaturated bond of the radical polymerization nature used for this invention, and irradiating an electron ray at a water solution When electron beam irradiation is given in the condition that moisture is not included, there is a possibility that collapse from which a chain is cut may advance preferentially and the meant crosslinking reaction may not progress, but if the water more than tales doses exists to said hydrophilic resin in coating liquid, it is checked that crosslinking reaction advances to dominance. In practice, since it is easy to gel so that the water dispersion of the detailed pigment suitably used by this invention becomes high concentration, the upper limit of concentration is decided in the field of the stability of a water paint in many cases. When the above point is taken into consideration, the solid content concentration of a water paint is 5 - 25 % of the weight more preferably three to 40% of the weight.

[0031] Without worsening the coating nature of a water paint remarkably besides a principal component, pore required for ink absorption is maintained, and if it is within the limits to which the water resisting property of an acceptance layer is not reduced sharply, other components can also be added to an ink absorbing layer. These additive itself may be the component which does not form hydro gel even if it irradiates an electron ray at a water solution. As the example, the cationic resin which is an ink fixing agent is mentioned. Although especially the class of cationic resin is not limited, either, the resin which includes the structural unit which has cationicity, such as the fourth class ghost of fourth class ghost [of N and N-dimethylamino ethyl acrylate], N, and N-dimethylaminoethyl methacrylate, the fourth class ghost of N,N-dimethylaminopropyl acrylamide, vinyl imidazo RIUMUMETO chloride, diaryl dimethylannmonium chloride, a monoallyl amine hydrochloride, and a diaryl amine hydrochloride, for example is mentioned. In addition, the cationic resin containing a dicyandiamide polyalkylene polyamine condensate, a secondary amine epichlorohydrin addition polymerization object, a poly epoxy amine, etc. is also available. Moreover, it is also possible as cationic matter to blend mineral salt, alumina sol, etc.

[0032] In addition, a defoaming agent is mixed as an additive, in order to improve the workability at the time of coating, or to improve wettability of a base material and to obtain a uniform ink absorbing layer, a surface active agent can also be blended, and for the reason on the **** disposition of blocking prevention of a record object or a printer, starch and a synthetic-resin particle may be mixed. moreover, adjustment of transparency or surface gloss -- various pigments other than a principal component -- it can also add -- the improvement in shelf life of a printing image sake -- an ultraviolet ray absorbent and Mitsuyasu -- a law -- light-fast improvers, such as a-izing agent, can also be added.

[0033] After mixing to a water paint beforehand and forming a coating layer first as the addition approach of these additives, it is the approach of finishing the solution containing an additive, spraying and sinking in, and you may add later. When adding an additive beforehand to a water paint and the coating has gelled with the shock of addition, it is an effective means to also make it re-distribute using a mechanical means. For example, since coating is possible if it is made to re-distribute using a mechanical means, although a coating will be temporarily gelled for both electrostatic property, if cationic resin is added to the dispersion liquid of an anionic pigment, such as a silica, and both are binding in static electricity and firmly in the paint film after desiccation, even if a bridge is not constructed especially over cationic resin, the water resisting property of a paint film is fully maintained.

[0034] The ink absorbing layer obtained by this invention can also be formed into a multilayer configuration, although it can come out further and can demonstrate sufficient surface gloss, and image quality and ink drying. In that case, "spreading, electron beam irradiation, and desiccation" may be repeated, it may apply and the following layer may be applied after electron beam irradiation, after spreading, the following layer may be applied immediately and electron beam

irradiation may be performed. Furthermore, coating of the multilayer may be carried out to coincidence, and electron beam irradiation may be performed. Moreover, it is not necessary to perform electron beam irradiation about a layer without need. Especially when making it a multilayer configuration, it is suitable to use the acceptance layer of said this invention as a surface layer taking advantage of the front-face nature of high quality very much.

[0035] If it is going to dry at once after applying two or more layers by the usual coating approach which does not use an electron ray, between layers will be in disorder before desiccation termination, the coating of each class will be mixed, and nonuniformity will arise in the amount of coating of each class obtained, or it will have a bad influence on quality in many cases. In order a coating is hypoviscosity, or coating is a low speed, or for mixing of each class to tend to occur when it is the amount of high coating, and to obtain a multilayer without turbulence on such conditions especially, it is desirable to repeat "spreading and desiccation" for each class. However, since it repeating "spreading and desiccation" not only has bad operability, but is accompanied by generating of maculature, increase of a desiccation load, etc., productive efficiency also cannot but become low. Furthermore, the bond strength between layers also tends to fall depending on a formula, and between layers becomes easy to exfoliate. In that respect, if hydro gelation of the coating after spreading is immediately carried out using electron beam irradiation, the large turbulence between layers can be controlled and a multilayer coating layer also with the high adhesion between layers can be obtained.

[0036] If it is made to perform the upper spreading after establishing an electron-beam-irradiation process after lower layer spreading when carrying out continuation coating of two or more layers with a separate head especially, since multilayer coating can be performed in the condition of having been stabilized more, it is suitable. Moreover, since the upper spreading will be carried out after water has been [method / such / multilayer coating] full of the pore in a lower layer, the upper coating enters into lower layer pore, and does not decrease a lower layer pore capacity. Therefore, it is very suitable as the coating approach in case a coating layer needs porosity like the ink jet record object of this invention. On the other hand, if electron beam irradiation is immediately performed after multilayer coating since comparatively highly precise multilayer coating is possible rather than it carries out continuation coating with a separate head when performing coincidence multilayer coating, the turbulence between layers under desiccation can be controlled and a multilayer coating layer with a fully high precision can be obtained.

[0037] Although sheets generally used as a base material of an ink jet record object, such as paper of fine quality, a report grade paper, coat paper, art paper, cast coated paper, the paper board, a synthetic-resin laminated paper, metal vacuum evaporation paper, a synthetic paper, and a white film, can be used as a base material, it is not limited to these. Especially, since the acceptance layer of high gloss is obtained very much even if a synthetic-resin laminated paper, metal vacuum evaporation paper, a synthetic paper, a white film, etc. have a smooth front face, and it does not use means, such as a film replica method and cast coating, when an absorbency low base material sheet is used comparatively, it is suitable. Moreover, if the plastic film the transparency of polyethylene terephthalate, a polyvinyl chloride, a polycarbonate, polyimide, cellulose triacetate, cellulose diacetate, polyethylene, polypropylene, etc. excels [plastic film] in the base material is used, the ink jet record object which can be used as light transmission nature record media, such as a back print and an OHP sheet, is producible. Since it is very high transparency, the ink absorbing layer obtained by this invention can be used suitable for these media.

[0038] These base materials can give an under coat, when adhesive strength with the ink absorbing layer formed in the front face is inadequate, or they can perform various kinds of easily-adhesive processings, such as corona discharge treatment. The thickness of a base material has desirable 50-500 micrometers, when the ***** of a printer is taken into consideration.

[0039] Although a coater well-known as the coating approach of a monolayer, for example, a bar coating machine, a roll coater, a blade coating machine, an air knife coater, a gravure coating machine, a die coating machine, a curtain coating machine, etc. can be used, it does not restrict

to these.

[0040] As equipment used for multilayer coating, a well-known coater, for example, a slot die coating machine, a slide die coating machine, a curtain coating machine, a knife coating machine, a bar coating machine, etc. are mentioned. In the case of coincidence coating, although coincidence multilayer coating equipments, such as a multilayer type slot die coating machine of dedication, a multilayer type slide die coating machine, and multilayer type curtain coating-machine **, can be used suitably, it does not restrict to these.

[0041] As weight after desiccation, about two 1 – 60 g/m is desirable still more desirable, and coverage is about two 3 – 50 g/m. Since absorbing [of ink] will be easy to become inadequate if fewer than 1 g/m² here, it will become easy to generate curl if [than 60 g/m²] more, and cost also increases, it is not desirable.

[0042] Moreover, with the ink absorbing layer of a base material sheet, a flesh-side surface layer can also be prepared in the opposite side for curl control of an ink jet record sheet, and improvement in conveyance nature. Although the configuration of a flesh-side surface layer, the easily-adhesive processing on the rear face of a base material sheet accompanying it, etc. can be chosen according to the application and it is not limited especially, if an example is taken in coating nature and cost, it is suitable to prepare the flesh-side surface layer which uses hydrophilic resin as a principal component.

[0043] About 50–300kV is suitable for the acceleration voltage at the time of a scanning method, a curtain beam method, a broad beam method, etc. being adopted, for example, and irradiating an electron ray as an exposure method of the electron ray in this invention. As for the exposure of an electron ray, it is desirable to adjust in the range of 0.1 – 20Mrad extent. Less than 0.1 Mrads are insufficient for making a coating layer gel, and since an exposure which exceeds 20Mrad has a possibility of bringing about degradation and discoloration of a base material or a coating layer, it is not desirable.

[0044] The ink jet record object of this invention has a very high water resisting property. Even when the resin which is water solubility is originally used as binder resin, in order for a bridge to be constructed over resin by electron beam irradiation and to form a three-dimensions mesh by it, even if it soaks the ink jet record object acquired in water, it hardly dissolves. If it prints on this record object, the amount of resin bridge formation soma will also absorb and swell ink all over an ink absorbing layer, the volume will expand, but since that swelling rate is slow compared with the ink rate of absorption by the capillarity of the whole ink absorbing layer, it does not spoil the speed of the ink absorptivity which is the advantage of a pigment system acceptance layer.

[0045]

[Example] This invention is not limited by these examples, although an example is given and this invention is explained concretely hereafter. In addition, %s other than Hayes displayed by this example mean percentage by weight.

[0046] It measured, after drying the water dispersion of a [pore capacity measuring method of detailed pigment] detailed pigment at 105 degrees C and carrying out the vacuum deairing of the obtained fine-particles sample at 200 degrees C as pretreatment for 2 hours using gas absorption method specific surface area and a pore distribution measuring device (the product made from Coulter, SA3100Plus mold). Pore capacity used the value which calculated a total pore capacity (Total Pore Volume) of pore with a pole diameter of 100nm or less from adsorption isotherm.

100ml of water dispersions of a [mean-particle-diameter measuring method of detailed pigment] detailed pigment was put into the cup made from 500ml ** stainless steel, distributed processing (for 3000rpm and 5 minutes) was carried out using the Tmade from special opportunity-ized Industry.K. HOMODI spur, and grinding distribution of the 3rd particle in a water dispersion was carried out. The water dispersion after processing was fully diluted with distilled water, it considered as the sample solution, and mean particle diameter was measured using the laser grain-size meter (the product made from Otsuka Electron, LPA 3000/3100) by dynamic light scattering. Mean particle diameter used the value computed from the analysis which used the KYUMURANTO method.

[0047] a non-[synthetic] fixed form silica (the product made from Japanese Silica Industry --)

with a [manufacture approach of silica sol A (dispersion liquid)] mean particle diameter of 3 micrometers Trade name: Nipsil HD-2, primary particle size = 11nm is distributed in water. After carrying out grinding distribution with a Sand grinder, further with a hydraulic extra-high voltage homogenizer (the product made from ***** Industry, Micro fluidizer M110-E/H) Grinding distribution was repeatedly carried out until the mean particle diameter (second [an average of] particle size) measured by the above-mentioned mean-particle-diameter measuring method was set to 168nm, and it considered as 11% of water dispersion. It was 1.2 ml/g when the pore capacity of the silica in this water dispersion was measured by the above-mentioned measuring method. In this dispersion-liquid 100 section, grinding distribution of the mixture which gelled 11% water solution of a diaryl dimethylannmonium chloride acrylamide copolymer (the Nitto Boseki Co., Ltd. make, trade name-AS-J-81) 10 *****s as an ink fixing agent was further carried out with this homogenizer, and the silica water dispersion with a mean particle diameter of 422nm was manufactured. These dispersion liquid were 11% of solid content concentration, and the diaryl dimethylannmonium chloride acrylamide copolymer concentration of silica concentration was 1% 10%. Moreover, it was 1.1 ml/g when pore capacity was measured, where this copolymer is included.

[0048] The hydraulic extra-high voltage homogenizer which used 11% water dispersion of a silica (the product made from Japanese Aerosil, trade name:AEROSIL 300) with a particle size [first / an average of] of 7nm manufactured by the [manufacture approach of silica sol B (dispersion liquid)] gaseous-phase method by the manufacture approach of the silica sol A distributed 3 times. It was 1.6 ml/g when the pore capacity of the silica in this water dispersion was measured by the above-mentioned measuring method. Moreover, mean particle diameter (second [an average of] particle size) was 228nm. The 11% water-solution 10 of the diaryl dimethylannmonium chloride acrylamide copolymer used for this dispersion-liquid 100 section by the manufacture approach of the silica sol A section was added, distribution was further repeated for the gelled mixture with this homogenizer, and the water dispersion of a silica with a particle size [second / an average of] of 376nm was manufactured. These dispersion liquid were 11% of solid content concentration, and the diaryl dimethylannmonium chloride acrylamide copolymer concentration of silica concentration was 1% 10%. Moreover, it was 1.4 ml/g when pore capacity was measured, where this copolymer is included.

[0049] Bar coating of the coating of 10.8% of solid content concentration which mixed the 23 sections of 10% water solutions of partial saponification polyvinyl alcohol (Kuraray Make, trade name-VA-420) in the <example 1> silica sol A100 section was carried out so that the amount of coating might be set to 25g/m² with dry weight on a transparence polyethylene terephthalate film (Toray Industries Make, a trade name: lumiler 100-Q80D) with a thickness of 100 micrometers which is a base material. The electron ray of the acceleration voltage of 175kV and quantity-of-radiation 5Mrad was immediately irradiated with electron-beam-irradiation equipment (electro curtain by the ESI company) at this. It turned out that the coating serves as a jelly-like solid-state when the coating side after an exposure is touched, and it became hydro gel. This was dried at the temperature of 100 degrees C, and the ink jet record object of this invention was manufactured. The condition of the acceptance layer of this ink jet record object, 75-degree gloss, Hayes, the water resisting property, and the approach of showing the image quality after printing, ink drying, and the pore capacity of an ink absorbing layer below further estimated, the ink absorbing layer formation approach was shown in Table 1, and the evaluation result was shown in Table 2.

[0050] Viewing estimated the condition of the coating layer of the appraisal method [condition of acceptance layer] ink jet record object of an ink jet record object to the following five steps. five point: -- four which crack and crack do not have point: -- three by which crack is contained in a part of coating layer point: -- two crack is contained in all over coating layer point: --

[0051] in which a fragment will exfoliate if the crack has occurred on the whole surface and a front face is touched and to which the crack has occurred all over 1 point:, and the fragment has exfoliated automatically during desiccation 75-degree gloss of [75-degree gloss] ink jet record object was measured according to JIS P8142.

[0052] Hayes of the ink jet record object which used the [Hayes] transparence base material

was measured according to JIS K7105.

[0053] The ink jet record object which cut off and carried out weighing capacity to [waterproof] 10cm angle was immersed in 1l. water. The ink jet record object was taken out 1 hour after, and after [desiccation] weighing capacity was carried out in 100-degree C hot blast. Dry weight percentage reduction (%) of the ink absorbing layer after water immersion was made into the waterproof valuation basis of an ink jet record object.

[0054] Two kinds of images ("highly-minute color digital standard image-data ISO/JIS-SCID", p13, an image name:fruit cage, p14, an image name: a candle, foundation method man-day book American Standards Association issue) of ISO-400 were printed on [image quality] ink jet record object by the paper recommendation setting print mode only for super fine one of an ink jet printer (the product made from EPSON, PM-700C), and viewing estimated image quality to the following five steps.

Five points: There is no overflow of ink, the boundary section of a color has also clarified, and the solid section is also uniform.

Four points: Although there is no overflow of ink, the boundary section of a color has faded a little.

Three points: Although there is no overflow of ink, nonuniformity is in the solid section a little.

Two points: Ink is full of some.

One point: Ink is overflowing and the image has failed.

[0055] It printed cyanogen, a Magenta, yellow, and each color solid of black on the [ink drying] ink jet record object by the paper recommendation setting print mode only for super fine one of an ink jet printer (the product made from EPSON, PM-700C). The PPC form was pressed against the printing section by hand, the existence of an imprint of ink was investigated visually, time amount until an imprint is lost was measured, the average of each color was calculated, and it evaluated to the following five steps.

five point: -- immediately after printing -- it is -- : [two :] with a minutes [less than 5 minutes] of four : less than 1 minute : [three :] 3 minutes or more 5 minutes or more less than 10-imprint-less minute 1 point: -- 10 minutes or more [0056] It exfoliated with the cutter knife and a [pore capacity measuring method of ink absorbing layer] base material to the ink absorbing layer was made into the sample. It measured, after carrying out the vacuum deairing of this sample at 200 degrees C as pretreatment for 2 hours using gas absorption method specific surface area and a pore distribution measuring device (the product made from Coulter, SA3100Plus mold). Pore capacity used the value which calculated a total pore capacity (Total Pore Volume) of pore with a pole diameter of 100nm or less from adsorption isotherm.

[0057] The same approach as an example 1 manufactured and estimated the ink jet record object of this invention except having used for the <example 2> silica sol A100 section the coating of 10.8% of solid content concentration which mixed the 23 sections of 10% water solutions of cationic partial saponification polyvinyl alcohol (Kuraray Make, trade name:CM-318). The ink absorbing layer formation approach was shown in Table 1, and the evaluation result was shown in Table 2.

[0058] The same approach as an example 1 manufactured and estimated the ink jet record object of this invention except having used for the <example 3> silica sol A100 section the coating of 10.0% of solid content concentration which mixed the 33 sections of 7% water solutions of full saponification polyvinyl alcohol (Kuraray Make, trade name-VA-140H). The ink absorbing layer formation approach was shown in Table 1, and the evaluation result was shown in Table 2.

[0059] The same approach as an example 1 manufactured and estimated the ink jet record object of this invention except having used for the <example 4> silica sol A100 section the coating of 10.8% of solid content concentration which mixed the 23 sections of 10% water solutions of the hydroxypropyl methylcellulose (the Shin-Etsu Chemical Co., Ltd. make, trade name:METOROZU 65SH-50, methoxyl group DS-1.8, hydroxypropoxyl group MS=0.15). The ink absorbing layer formation approach was shown in Table 1, and the evaluation result was shown in Table 2.

[0060] The same approach as an example 1 manufactured and estimated the ink jet record

object of this invention except having used for the <example 5> silica sol A100 section the coating of 10.8% of solid content concentration which mixed the 23 sections of 10% water solutions of polyethylene oxide (the Sumitomo Seika Chemicals Co., Ltd. make, trade name-EO-1). The ink absorbing layer formation approach was shown in Table 1, and the evaluation result was shown in Table 2.

[0061] The same approach as an example 1 manufactured and estimated the ink jet record object of this invention except having used the silica sol B100 section instead of the <example 6> silica sol A100 section. The ink absorbing layer formation approach was shown in Table 1, and the evaluation result was shown in Table 2.

[0062] The ink jet record object of this invention was manufactured by the same approach as an example 1 except having used the polyethylene system synthetic-resin laminated paper for the <example 7> base material. Except having not measured Hayes for this ink jet record object, the same approach as an example 1 estimated, and the result was shown for the ink absorbing layer formation approach in Table 1 in Table 2.

[0063] The same approach as an example 1 manufactured and estimated the ink jet record object of this invention except having used the coating of 10.7% of solid content concentration which mixed the 50 sections of 10% water solutions of the partial saponification polyvinyl alcohol used for the <example 8> silica sol A100 section in the example 1. The ink absorbing layer formation approach was shown in Table 1, and the evaluation result was shown in Table 2.

[0064] Production of a paint film was tried by the same approach as an example 1 except having dried immediately after coating, without irradiating the <example 1 of comparison> electron ray. However, since the coating layer crocodiled during desiccation and the fragment exfoliated automatically from the base material, the same approach as an example 1 was not able to estimate other than having carried out visual evaluation of the condition of a coating layer. The ink absorbing layer formation approach was shown in Table 1, and the evaluation result was shown in Table 2.

[0065] Production of a paint film was tried by the same approach as an example 2 except having dried immediately after coating, without irradiating the <example 2 of comparison> electron ray. However, since the coating layer crocodiled during desiccation and the fragment exfoliated automatically from the base material, the same approach as an example 1 was not able to estimate other than having carried out visual evaluation of the condition of a coating layer. The ink absorbing layer formation approach was shown in Table 1, and the evaluation result was shown in Table 2.

[0066] Production of a paint film was tried by the same approach as an example 3 except having dried immediately after coating, without irradiating the <example 3 of comparison> electron ray. Although the crack went into the coating layer during desiccation, since a fragment did not exfoliate from a base material, the same approach as an example 1 estimated. The ink absorbing layer formation approach was shown in Table 1, and the evaluation result was shown in Table 2.

[0067] Production of a paint film was tried by the same approach as an example 4 except having dried immediately after coating, without irradiating the <example 4 of comparison> electron ray. However, since the coating layer crocodiled during desiccation and the fragment exfoliated automatically from the base material, the same approach as an example 1 was not able to estimate other than having carried out visual evaluation of the condition of a coating layer. The ink absorbing layer formation approach was shown in Table 1, and the evaluation result was shown in Table 2.

[0068] Production of a paint film was tried by the same approach as an example 5 except having dried immediately after coating, without irradiating the <example 5 of comparison> electron ray. However, since the coating layer crocodiled during desiccation and the fragment exfoliated automatically from the base material, the same approach as an example 1 was not able to estimate other than having carried out visual evaluation of the condition of a coating layer. The ink absorbing layer formation approach was shown in Table 1, and the evaluation result was shown in Table 2.

[0069] Production of a paint film was tried by the same approach as an example 6 except having dried immediately after coating, without irradiating the <example 6 of comparison> electron ray.

However, since the coating layer crocodiled during desiccation and the fragment exfoliated automatically from the base material, the same approach as an example 1 was not able to estimate other than having carried out visual evaluation of the condition of a coating layer. The ink absorbing layer formation approach was shown in Table 1, and the evaluation result was shown in Table 2.

[0070] Production of a paint film was tried by the same approach as an example 7 except having dried immediately after coating, without irradiating the <example 7 of comparison> electron ray. However, since the coating layer crocodiled during desiccation and the fragment exfoliated from the base material, the same approach as an example 7 was not able to estimate other than having carried out visual evaluation of the condition of a coating layer. The ink absorbing layer formation approach was shown in Table 1, and the evaluation result was shown in Table 2.

[0071] After drying immediately after the <example 8 of comparison> coating, production of a paint film was tried by the same approach as an example 1 except having irradiated the electron ray of the acceleration voltage of 175kV, and quantity-of-radiation 5Mrad. However, the coating layer crocodiled during desiccation, and since the condition that the fragment exfoliated automatically from the base material did not change even if it irradiated the electron ray, it was not able to be estimated by the same approach as an example 1 other than having carried out visual evaluation of the condition of a coating layer. The ink absorbing layer formation approach was shown in Table 1, and the evaluation result was shown in Table 2.

[0072] The same approach as an example 1 manufactured and estimated the paint film except having used the coating of 10.3% of solid content concentration which mixed the 200 sections of 10% water solutions of the partial saponification polyvinyl alcohol used for the <example 9 of comparison> silica sol A100 section in the example 1. The ink absorbing layer formation approach was shown in Table 1, and the evaluation result was shown in Table 2.

[0073] The same approach as an example 1 manufactured and estimated the paint film except having used the coating of 10% of solid content concentration which mixed the 10% water-solution 100 of the polyethylene oxide used for the 10% water dispersion 100 of <example 10 of comparison> colloidal silica (the Nissan Chemical Industries make, trade name: Snow tex-O, and catalog written particle size are 10-20nm) section in the example 5 section. 54nm and the pore capacity measured value of the mean-particle-diameter measured value by the dynamic light scattering of the colloidal silica used in this example of a comparison were 0.22 ml/g. The ink absorbing layer formation approach was shown in Table 1, and the evaluation result was shown in Table 2.

[0074] the same approach as an example 1 manufactured and estimated the paint film except having use the coating of 10.9% of solid content concentration which mixed the pentaerythritol tetraacrylate (product made from new Nakamura chemistry, trade name NK ester A-TMM -3) 1 section which be an electron ray hardenability compound in the 10 -% water dispersion 100 of <example 11 of comparison> fibrous hydrated alumina (the product made from industry, a trade name: catalyst formation KATAROIDO AS- 3 and catalog written particle diameter 100nmx 10nm) section. 788nm and the pore capacity measured value of the mean-particle-diameter measured value by the dynamic light scattering of the hydrated alumina used in this example of a comparison were 0.57 ml/g. The ink absorbing layer formation approach was shown in Table 1, and the evaluation result was shown in Table 2.

The same approach as an example 1 manufactured and estimated the paint film except having used as a coating 10% water solution of the partial saponification polyvinyl alcohol used in the <example 12 of comparison> example 1. The ink absorbing layer formation approach was shown in Table 1, and the evaluation result was shown in Table 2.

Production of a paint film was tried by the same approach as an example 1 except having used for the <example 13 of comparison> silica sol A100 section the coating of 10.9% of solid content concentration which mixed the polyethylene-glycol diacrylate (product [made from new Nakamura chemistry] trade-name NK ester A-400: acryloyl equivalent 254) 1 section which is an electron ray hardenability compound. However, since the coating layer crocodiled during desiccation and the fragment exfoliated automatically from the base material, the same approach as an example 1 was not able to estimate other than having carried out visual evaluation of the

condition of a coating layer. The ink absorbing layer formation approach was shown in Table 1, and the evaluation result was shown in Table 2.

[0075]

[Table 1]

	インク受容層形成方法				
	基材	微細顔料	親水性樹脂		電子線照射 のタイミング
			種類	添加量 (重量部)	
実施例1	透明PET	シリカゾルA	部分けん化PVA	23	乾燥前
実施例2	透明PET	シリカゾルA	カチオン性PVA	23	乾燥前
実施例3	透明PET	シリカゾルA	完全けん化PVA	23	乾燥前
実施例4	透明PET	シリカゾルA	HPMC	23	乾燥前
実施例5	透明PET	シリカゾルA	PEO	23	乾燥前
実施例6	透明PET	シリカゾルB	部分けん化PVA	23	乾燥前
実施例7	ラミ紙	シリカゾルA	部分けん化PVA	23	乾燥前
実施例8	透明PET	シリカゾルA	部分けん化PVA	50	乾燥前
比較例1	透明PET	シリカゾルA	部分けん化PVA	23	照射なし
比較例2	透明PET	シリカゾルA	カチオン性PVA	23	照射なし
比較例3	透明PET	シリカゾルA	完全けん化PVA	23	照射なし
比較例4	透明PET	シリカゾルA	HPMC	23	照射なし
比較例5	透明PET	シリカゾルA	PEO	23	照射なし
比較例6	透明PET	シリカゾルB	部分けん化PVA	23	照射なし
比較例7	ラミ紙	シリカゾルA	部分けん化PVA	23	照射なし
比較例8	透明PET	シリカゾルA	部分けん化PVA	23	乾燥後
比較例9	透明PET	シリカゾルA	部分けん化PVA	200	乾燥前
比較例10	透明PET	コロイダルシリカ	PEO	100	乾燥前
比較例11	透明PET	アルミナ水和物	A-TMM-3	10	乾燥前
比較例12	透明PET	なし	部分けん化PVA	—	乾燥前
比較例13	透明PET	シリカゾルA	A-400	10	乾燥前

[0076]

[Table 2]

	品質						
	受容層の 状態	75° 光沢	ヘイズ (%)	耐水性 (%)	画質	インク乾燥性	インク受容 層の細孔 容量 (ml/g)
実施例1	5	43.6	42.5	2	5	5	0.74
実施例2	5	46.6	39.7	1	5	5	0.75
実施例3	5	46.4	47.6	1	5	5	0.78
実施例4	5	48.6	25.4	3	5	5	0.75
実施例5	5	34.5	42.8	1	5	5	0.73
実施例6	5	103.7	11.0	2	5	5	0.99
実施例7	5	40.8	—	2	5	5	0.74
実施例8	5	38.4	57.0	1	4	4	0.47
比較例1	1	評価不能					
比較例2	1	評価不能					
比較例3	2	20.3	49.4	6	3	3	0.62
比較例4	1	評価不能					
比較例5	1	評価不能					
比較例6	1	評価不能					
比較例7	1	評価不能	—	評価不能			
比較例8	1	評価不能					
比較例9	5	52.5	30.7	2	2	2	0
比較例10	5	150.4	4.2	2	1	1	0
比較例11	3	42.3	41.2	1	3	3	0.43
比較例12	5	152.2	2.9	5	3	2	0
比較例13	1	評価不能					

[0077] above-mentioned Table 1 and 2 -- setting -- Transparency PET -- a transparency polyethylene terephthalate film and lamination paper -- in a polyethylene system synthetic-resin laminated paper and PVA, polyethylene oxide and A-TMM -3 show pentaerythritol tetraacrylate, and, as for polyvinyl alcohol and HPMC, A-400 shows polyethylene-glycol diacrylate, as for the hydroxypropyl methylcellulose and PEO. In Table 1, addition number of copies of resin shows solid content addition number of copies to the solid content 100 section of a pigment. A waterproof numeric value is the dry weight percentage reduction of an ink absorbing layer. Moreover, since the base material was opaque, what used the polyethylene system synthetic-resin laminated paper for the base material (an example 7, example 7 of a comparison) did not perform evaluation of Hayes.

[0078] Even when the detailed pigment which a crack tends to produce was used as a raw material, the dry weight percentage reduction at the time of having become a coating layer without a crack, and a water resisting property being also high and being immersed in water by the structure of cross linkage, of the ink jet record object of this invention was also very small so that clearly from the examples 1-8 of Table 2. Furthermore, since the image quality at the time of printing with an ink jet printer and ink drying had the description of a detailed pigment system acceptance layer, they became high quality very much. Especially when the diameter of an aggregated particle used a uniform detailed pigment small like an example 6, high gloss and the coating layer of high transparency were able to be obtained very much. Moreover, the detailed pigment layer of the amount of high coating was able to be further obtained by coating, without performing special surface data smoothing, even when a polyethylene system synthetic-resin laminated paper is used as a base material like an example 7.

[0079] After, applying to a base material the water paint used in the examples 1, 2, 4-7 on the other hand, when it dried immediately, it crocodiled, while the coating layer dried, and the fragment exfoliated automatically from the base material, and a paint film usable as an ink jet record object was not obtained (examples 1, 2, 4-7 of a comparison). Even if it irradiated the electron ray at the paint film, the coating layer which is changeless in the appearance of a paint film and does not have a crack was not obtained (example 8 of a comparison). Moreover,

although a fragment did not exfoliate automatically during desiccation probably because the used full saponification polyvinyl alcohol was very the amount of macromolecules when the water paint used in the example 3 was dried immediately after applying to a base material. Since ink had been spread in accordance with a crack also when the crack checked easily occurs all over a coating layer and it not only became an appearance unsuitable as an ink jet record object, but it prints visually, the printing image failed greatly. Furthermore, if a paint film is immersed in water, a part of coating layer would exfoliate and it will have distributed underwater (example 3 of a comparison). When there were more amounts of binder resin than a pigment, a problem did not occur in the appearance of a paint film, but since the pore of a pigment was buried by resin and a porous ink absorbing layer was not formed, ink absorption by capillarity was not performed but image quality and ink drying fell remarkably (example 9 of a comparison). Also when the 100 sections of binder resin were added to the colloidal silica 100 section using commercial colloidal silica as a pigment, a porous ink absorbing layer was not formed but image quality and ink drying fell remarkably (example 10 of a comparison). Moreover, since the whole coating layer surface could not be made to gel but a crack and exfoliation produced after desiccation in a part of coating layer even if it irradiated the electron ray, since the compatibility of a pigment and an electron ray hardenability compound was bad when the 10 sections of pentaerythritol tetraacrylate which is an electron ray hardenability compound instead of binder resin were added to hydrated alumina, using hydrated alumina as a pigment, it became an appearance unsuitable as an ink jet record object. Furthermore, probably because hardening of an electron ray hardenability compound was also inadequate, when printed with the ink jet printer, there was also a part into which an image bleeds (example 11 of a comparison). Since pore was not formed in the interior of an acceptance layer at all although the appearance of an acceptance layer was good when it considered as a resin system acceptance layer without a detailed pigment, the rate of absorption of ink became extremely slow, and image quality and ink drying fell sharply (example 12 of a comparison). Since the reinforcement of the gel obtained by electron beam irradiation was very weak although the problem was not produced in compatibility with a pigment when using the high electron ray hardenability compound of a hydrophilic property like the example 13 of a comparison, the coating layer has crocodiled during desiccation.

[0080]

[Effect of the Invention] Even when a detailed pigment with a big pore capacity which a crack tends to generate is used by this invention at the time of coating, a good ink absorbing layer without a crack can be formed. Even if pore capacity uses the detailed pigment of 1.0 or more ml/g, makes the amount of hydrophilic resin the minimum and applies further two or more [20g //m] by coating with dry weight especially, an ink absorbing layer without a crack can be formed. The ink jet record object which prepared this ink absorbing layer on the base material is excellent in gloss, transparency, and a water resisting property, and image quality and ink drying are good.

[Translation done.]